AGU FALL MEETING
San Francisco | 12–16 December 2016

V31A-3063: A comparative study of volatile contents of primitive arc bubble-bearing melt inclusions determined by Raman-spectroscopy and mass-balance versus experimental homogenization methods

Wednesday, 14 December 2016
08:00 - 12:20
Moscone South - Poster Hall

Primitive olivine-hosted melt inclusions (MI) are a useful means to estimate the pre-eruptive volatile contents of a volcanic melts but post-entrapment processes complicate this approach. In particular, crystallization of the host phase along the wall of the MI and diffusion of H^+ through the host cause CO_2 and potentially S or other volatiles to exsolve from the melt to a separate fluid bubble. Recently, experimental rehydration and Raman spectroscopy have become potential methods for restoring the volatile contents of MI by rehomogenization or through mass balance calculations respectively. In order to compare these two approaches, we have studied MI from a single suite of samples from Klyuchevsky volcano (Kamchatka Arc) that have been treated with both experimental rehydration and analyzed using Raman spectroscopy. The maximum MI CO_2 contents are in agreement (~4000 ppm) regardless of the method used to account for CO_2 in the bubble, but there is significantly more scatter to lower values using the Raman method which can be attributed to uncertainty related to mass balance calculations and carbonate daughter minerals that have formed at the glass-bubble interface. The presence of S- and C-bearing daughter minerals on the surface of the bubble in unheated melt inclusions indicates that to obtain more confident results with Raman spectroscopy, naturally quenched MIs should be also shortly reheated to dissolve most or all the crystals at the glass-bubble interface. Concerning H_2O, MI from the unheated tephra samples contain less H_2O than rehydrated MI in lavas. Determining the original H_2O content of rehydrated MI is difficult because the H_2O concentration in the glass is controlled by the conditions during the rehydration experiment. Thus reconciling the initial H_2O content in primitive arc MIs (and degree of H_2O loss) still remains a challenging task.

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